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Part-time Special Education Predicts Students' Reading Self-concept Development

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Abstract

The academic self-concept changes from childhood to early adulthood in relation to experiences of capability in different school tasks and comparison with peers. Students in special education have a lower academic self-concept than their peers do, but it is unclear how part-time special education affects self-concept development. In Finnish schools, part-time special education is learning support that is usually provided for 1–2 hours/week in small groups. The main aim of this study was exploring the effects of participation in part-time special education and gender on the level and change in three academic self-concept domains (General School, Mathematics and Reading) between the ages of 11 and 13 years ($N = 669$). Use of the multilevel growth curve model revealed negative linear development in all three self-concept domains from Grades 5 to 7, but participation in part-time special education had a statistically significant positive effect on the development of the Reading self-concept.

Keywords: academic self-concept, part-time special education, longitudinal research

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1.1 Introduction

A positive self-concept is frequently cited as a central goal of education (O'Mara, Green, & Marsh, 2006) and an important vehicle for addressing social inequities experienced by disadvantaged groups (Möller, Pohlman, Köller, & Marsh, 2009). In addition to being a significant outcome variable, self-concept is an important mediating construct that facilitates the attainment of other desirable psychological and behavioural outcomes, such as increased adoption of adaptive striving behaviours (Marsh, 2007), educational and career aspirations and attainment (Guay, Larose, & Boivin, 2004; Marsh, 2007), improved achievement (Guay, Marsh, & Boivin, 2003; Marsh & Craven, 2006; Möller et al., 2009), mental health (Ybrandt, 2008) and maximising human potential (Craven & Marsh, 2008). The purpose of this paper is to describe how academic self-concepts develop from Grade 5 to Grade 7 and test whether there are differences in this development between students who do and do not receive part-time special educational support.

The academic self-concept comprises an individual's overall perceptions of the academic domain. This construct is more evaluative and cognitive than global self-esteem is, and it is strongly associated with school performance (Rosenberg, Schooler, Schoenbach, & Rosenberg, 1995) and academic outcomes (Marsh, Tracey, & Craven, 2006). Academic self-concept is related to, but distinct from, academic self-efficacy, the perceived confidence in one's capability to perform a certain task successfully in a more or less specific academic domain (Bong & Skaalvik, 2003; Parker, Marsh, Ciarrochi, Marshall, & Abduljabbar, 2014; Tabassam & Grainger, 2002). In contrast, self-concept is an evaluative judgement about whether a person's performance matches his or her personal standards of competence in an academic domain (Parker et al., 2014). Academic self-concept has been shown to be segmented and hierarchical; for example, the Mathematics self-concept and Reading self-concept are nearly uncorrelated (Marsh, Byrne, & Shavelson, 1988;

Marsh, Craven, & Debus, 1999; Möller et al., 2009), but both correlate substantially with the General-School self-concept (Marsh, 1990a).

As an individual grows from childhood to adulthood, the self-concept becomes increasingly differentiated and more highly correlated with external indicators of competence, such as skills and the self-concept inferred by significant others (Bear, Minke, Griffin, & Deemer, 1998; Marsh, 1990a). Adolescents experience transitions, such as puberty, neurocognitive development (Sebastian, Burnett, & Blakemore, 2008) and changes in the school context, like competitiveness, stricter evaluation and more demanding curricula, which are all related to the changes in the self-concept (Eccles et al., 1993; Wigfield, Lutz, & Wagner, 2005). At the same time, peer relations and acceptance of peers gain increasing importance (Allodi, 2000; Preckel, Niepel, Schneider, & Brunner, 2013). As previous research shows, self-competence beliefs decline across middle childhood and early adolescence, and this decline is dissimilar in different domains of self-concept (Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Marsh, 1989; Marsh & Ayotte, 2003; Wigfield, Eccles, Mac Iver, Reuman, & Midgley, 1991). Some scholars have found that the Mathematics self-concept declines linearly (Jacobs et al., 2002; Wigfield et al., 1991), but others have instead found a mild U-shaped development during adolescence (Marsh, 1989; Marsh & Ayotte, 2003). In language or reading, the self-concept also decreases until a positive upturn occurs in Grade 9 or 10, when students are approximately 14–16 years of age (Jacobs et al., 2002; Marsh, 1989).

Gender differences in specific self-concept domains seem to be connected to gender stereotypes (Marsh, 1989; Wigfield et al., 1991). Gender stereotyping is a generalisation that has to do with the characteristics of a group of people, and it influences students' self-concept and academic achievement (Igbo, Onu, & Obiyo, 2015). Girls seem to have higher self-concepts in reading (De Fraine, Van Damme, & Oneghena, 2007; Marsh & Ayotte, 2003; Wouters, Colpin, Van Damme, De Laet, & Versueren, 2013) but lower self-concepts in math (Fredricks & Eccles, 2002; Marsh & Ayotte, 2003) than boys do. There is also evidence of a narrowing gender gap in the math

self-concept (Fredricks & Eccles, 2002; Jacobs et al., 2002) and a widening gap in the language self-concept (Jacobs et al., 2002). Some studies have found that gender differences are stable from elementary to middle school (Cole et al., 2001; Rhodes, Roffman, Reddy, & Fredriksen, 2004), including gender differences among students with disabilities (Bear, Minke, & Manning, 2002; Wei & Marder, 2011).

The academic self-concept seems to be lower for pupils with learning disabilities (Bear, Clever, & Proctor 1991; Chapman, 1988b; Tabassam & Grainger, 2002), mild intellectual disabilities (Marsh et al., 2006; Szumski & Karwowski, 2015), dyslexia (Polychroni, Koukoura, & Anagnostou, 2006) or low achievement (Clever, Bear, & Juvonen, 1992), as well as pupils who need special educational support, compared with peers without these difficulties (Allodi, 2000; Pijl & Frostad, 2010). It seems that, for many students with learning disabilities, a decrease in academic self-concept occurs during their early school years, and the students' self-concept remains at a low level (Chapman, 1988b) or decreases linearly with age (Tabassam & Grainger, 2002). Frequent experiences of failure in school (Wei & Marder, 2011; Zeleke, 2004) or appraisal of academic difficulties (Bear et al., 2002) are assumed to be the reasons for this decrease in self-concept.

How special education affects students' self-concept is a complex issue, and alternative explanations have arisen from researchers' preferred theoretical perspectives on the formation of self-concept. The internal/external frame of reference (I/E) model defines that students make parallel external (social) and internal (temporal and dimensional) comparisons as the basis for forming their own academic self-concepts (Marsh & Hau, 2003; Marsh et al., 2014; Marsh et al., 2018). Students use dimensional comparisons to analyse their strong and weak dimensions of self-concept and temporal comparisons to compare their current performance and abilities with their previous performance. These comparisons explain, for example, how below-average students can develop a relatively high positive domain-specific self-concept in a certain subject (Möller &

Köller, 2001; Möller & Marsh, 2013). An external frame of reference is the social comparison between students' academic achievements and the achievement of peers in the same classroom (Roy, Guay, & Valois, 2015). These social comparisons can produce either assimilative or contrastive effects on students' academic self-concept, and the direction of comparisons can be upward or downward. Individuals are not objective or unbiased self-evaluators, and these social comparisons may serve different motives, from self-evaluation to self-enhancement or self-improvement (Dijkstra, Kuyper, van der Werf, Buunk, & van der Zee, 2008).

This social comparison process results in an unflattering upward comparison for students with learning difficulties, and it is not surprising that their academic self-concept is more negative than that of their peers in mainstream classrooms (Bear et al., 1991; Bear et al., 2002; Chapman, 1988a; Zeleke, 2004), while it is higher for students in separate special classes or special schools than the self-concept of their similarly low-achieving peers in regular education is (Chapman, 1988b; Szumski & Karwowski, 2015; Tracey & Marsh, 2000). A frequently mentioned theoretical explanation for this is called the big-fish–little-pond effect (BFLPE), which predicts that students have lower academic self-concepts when attending schools or classes where the average ability levels of other students is high compared with equally able students attending schools where the average ability of the school or a class is low (Dijkstra et al., 2008; Marsh et al., 2008).

Another view of social comparison emphasises assimilation in a peer group. Belonging to a selected education group for the gifted may have a positive effect ('reflected glory'), but selective education in a group for those with learning disabilities may also have a negative effect, usually called 'labelling' (Szumski & Karwowski, 2015). Predictions based on labelling theory imply that grouping academically disadvantaged students with other low-achieving ones may lead to the lowering of the students' academic self-concepts (Marsh & Craven, 2002; Marsh et al., 2006; Tracey & Marsh, 2000). However, in a meta-analysis of 36 research reports, Elbaum (2002) did not find a systematic relationship between students' self-concepts and educational settings.

Finally, some evidence supports the idea that pedagogical support in school affects students' self-concepts positively. Students with learning problems in mainstream education classrooms who do not receive any special educational support have lower academic self-concepts than do their peers who receive remedial assistance (Chapman, 1988b) or full-time remedial placement (Boersma, Chapman, & Battle, 1979). Based on the previous research, placing students with learning difficulties in full-time special education or leaving them in regular education without support results in a lower academic self-concept.

In summary, previous studies have mainly been cross-sectional comparisons between the self-concepts of students with special educational needs (SEN) or learning disabilities and other students (see, e.g. Zeleke, 2004). There are only a few studies related to special education support and self-concept that have a longitudinal focus (see, e.g. Gorges, Neumann, Wild, Stranghöner, & Lütje-Klose, 2018), and to our knowledge, none have employed a longitudinal design for estimating the effects of part-time learning support for students who have learning problems but study in mainstream education. In this study, we explore the development and changes in the academic self-concepts of Finnish students between Grades 5 and 7 (primary and junior secondary education), aged 11–13 years. The main aim of this study was determining whether the level and development of academic self-concept depend on participation in part-time special education in this age group. The following research questions guided the study:

- How do three academic self-concept domains (General School, Reading, Mathematics) develop during Grades 5, 6 and 7?
- What effects do gender and part-time special educational support have on the level and trend of the three academic self-concept domains (General School, Reading, Mathematics) during Grades 5, 6 and 7?

Based on earlier research findings, we set the following research hypotheses:

- Hypothesis 1: We expect that the levels of academic self-concepts will decrease from Grade 5 to Grade 7 (Bear et al., 1998; Jacobs et al., 2002; Marsh, 1989; Marsh, 1990a; Marsh & Ayotte, 2003; Wigfield et al., 1991);
- Hypothesis 2: In accordance with the gender stereotype, we expect that girls will have a higher self-concept in Reading (De Fraine et al., 2007; Marsh & Ayotte, 2003; Wouters et al., 2013) and lower self-concept in Math (Fredricks & Eccles, 2002; Marsh & Ayotte, 2003) than boys do;
- Hypothesis 3: We expect that the levels of academic self-concepts of students receiving part-time special education support while otherwise studying in mainstream classes will be lower than that of their peers (Allodi, 2000; Bear et al., 1991; Bear et al., 2002; Chapman, 1988b; Pijl & Frostad, 2010; Zeleke, 2004); and
- Hypothesis 4: We expect that there will be no differences in the trends of self-concept development between girls and boys (Bear, Minke, & Manning, 2002; Cole et al., 2001; Rhodes et al., 2004; Wei & Marder, 2011).

Since there are no longitudinal studies on the effect of part-time special education support on self-concepts for students studying in the mainstream setting, and findings on the relationship between special education support and development of academic self-concepts are inconclusive and contradictory, no hypothesis was developed on part-time special education's effect on the trend of academic self-concepts.

2.1 Method

2.1.1 Sample

The data for this study were collected as part of the ISKE research project, which took place in the eastern Finland region in collaboration with 30 primary schools (Grades 5 and 6) and 18 junior high schools (Grade 7). The research project followed the ethical guidelines of the university and participating organisations. All the schools volunteered to participate, and their

inclusion was authorised by their principals and local education authorities. Participation by the teachers and students in the project schools was voluntary, and written informed consent to participate was received from the parents of all students included in the study. In the data for this study, we excluded the small group of students who had been identified as having SEN, which means they obtain intensive support and can have individually adapted curricula in one or more subjects. These students mainly attended special classes, although some of them studied in mainstream classes on a part- or full-time basis with individual educational plans and support. Without knowledge of the extent of adjustments of their mathematics and reading curricula or specific placement determining their reference group for social comparisons, including them in the analysis would have resulted in ambiguity. However, data from students who received part-time special education support (13%) were included, as they all follow the same curricula as their classmates.

In this longitudinal study, students' academic self-concepts were measured each year, resulting in three measurement points. The total sample with data from at least one measurement point on the self-concept scales were available for 669 students. For most of the students, the self-concept measurements are available at all three measurement points (368 students, 50.6%), but there are also students for whom we have self-concept data at only two (220 students, 30.3%) or one measurement point (81 students, 11.1%). A total of 1625 observations are available at the measurement level.

2.1.2 Variables

The main interest in this study was the academic self-concept scales derived from the Self-description Questionnaire (SDQ-I; Marsh, 1990b). The variables of gender, achievement and part-time special educational support were included in the statistical analyses to test whether self-concept in Grade 5 and the development of self-concept from Grade 5 to Grade 7 are related to these characteristics. The descriptive statistics of the variables are presented in Table 1.

Self-concept. The SDQ-I (Marsh, 1990b) is a widely used instrument developed to measure eight self-concept domains. We concentrated on three academic self-concept domains, as follows: the General School, Reading and Mathematics self-concept subscales. Each scale contains eight items that are all written in a positive direction and describe domain-specific characteristics (for details, see Marsh, 1990b). The reliabilities of the scales on the three measurements were .89, .91 and .92 (General School); .91, .92 and .92 (Reading); and .95, .95 and .95 (Mathematics). Measurement invariance was tested by running Confirmatory Factors Analysis with WLSMV estimation comparing a configural model (freely loading factors across measurements) to a scalar model (factor loadings and thresholds fixed equally across the three measurements). As the sample size was large, a Chi-square test for difference was not used. Instead, comparison was made with CFI values, where Chen (2007) suggested that a change of less than 0.01 in the CFI indicates invariance between models. The changes in the CFI were .008, .001 and .002 for the models of self-concept in Reading, Mathematics and General School¹, respectively, thereby supporting invariance across time.

Gender. Gender is a binary variable, and the boys in the sample were the reference group in the analyses.

School grades. We measured the students' school grades for Writing, Reading and Mathematics in Grades 5 and 6 (the first two measurement points) and collected the students' grades for Finnish, Swedish, English and Mathematics in Grade 7 (the third measurement point). For the Mathematics academic self-concept, we included the specific Mathematics grades in the model as predictors. For modelling the Reading self-concept, we used the reading grades for

1

Self-conc.:	Chi sq./ d.f.	Configural			Chi sq./ d.f.	Scalar		
		RSMSEA	CFI	WRMR		RSMSEA	CFI	WRMR
Reading	549.97 / 237	.041	.992	1.103	974.1 / 307	.053	.983	1.525
Math	555.4 / 240	.041	.996	.836	558.5 / 296	.034	.997	.935
Gen.School	644.8 / 239	.047	.985	1.073	658.1 / 309	.038	.987	1.250

Grades 5 and 6 and the Finnish grade from Grade 7 as predictors. For the General School self-concept subscale, we included the average of all the school grades in the model.

Part-time special educational support. In this study, students who did not receive additional support served as the reference group and were compared to students who received part-time special educational support. Part-time special education is a common system of learning support in Finnish schools, in which students are given special educational support 1–2 hours/week in the area where they have difficulties. It is a flexible support system in which students do not need a specific diagnosis. The need for support found by teachers or guardians is sufficient for justifying the pedagogical arrangements. During the time of the study, the support system was being reformed into a three-tiered model of support, where part-time special education corresponds best to the second-tier intensified support. We received data on students receiving the old or new type of support from the schools' part-time special education teachers.

(Table 1 about here)

2.1.3 Method of Analysis

Multiple imputation through chained equations. All the predictors of academic self-concept in this study have missing scores for some students at one or more measurement points. Of all the values in the predictor variables, 78.59% were complete. However, the missing values were distributed over many students. This results in a pattern in which only 32.74% (219) of the total 669 students had a complete record for all predictor variables at all three measurement points. However, for most of the students, little information is missing. In such a case, the frequently used method of listwise deletion of cases with missing values wastes information and can lead to biased results (Graham, 2009). As often occurs in longitudinal studies, missing completely at random (MCAR) does not hold for this dataset, Little's MCAR test $\chi^2(56) = 106.614, p < .001$. A series of separate variance *t*-tests was conducted to test for missing at random (MAR). Of a total of 110 variance *t*-tests, 92 *t*-tests showed nonsignificant results indicating independence in missingness

given the observed data, whereas 18 *t*-tests were significant. Therefore, we consider the data MAR; thus, conditionally, given the observed data, the missingness indicators are independent of the unobserved data. Therefore, the multiple imputation through chained equations technique was applied (Snijders & Bosker, 2012; Van Buuren, 2011) to impute missing values, which has proven to lead to good (unbiased) results under MAR (e.g. Rubin, 1987; Snijder & Bokser, 2012). Although this technique does not assume that the variables with missing values have a multivariate distribution as in regular multiple imputation, and the technique has incomplete theoretical grounding, the method is flexible, and the results from simulation studies are promising (Van Buuren, Brand, Groothuis-Oudshoorn, & Rubin, 2006).

We set up an imputation model using the MICE package in R (Van Buuren & Groothuis-Oudshoorn, 2011). We based the imputation model on the following rules:

- Only predictor variables were imputed; the scores on the self-concept scales (dependent variable) were not imputed;
- Based on the measurement level of the variables, appropriate methods were selected, namely logistic regression for the binary variables gender and special educational support (logreg) and predictive mean matching (pmm) for the grades;
- Variables were included in the imputation model as predictors if the bivariate correlation between the imputed variable and the predictor was larger than $r = 0.30$;
- Predictors were included when there were at least 30% usable cases; and
- Self-concept scores were used as auxiliary variables, and therefore, they were allowed as predictors in the imputation model.

The distributions of the variables in the imputed datasets were much like the original distributions, and convergence was achieved quickly for each of the imputed variables (i.e. within 10 iterations). We constructed 25 datasets with imputed values; this number was roughly based on the percentage of missing values in the dataset, and in line with recommendations by Graham,

Olchowski and Gilreath (2007), stating that at least 20 imputations are necessary if the missing fraction ranges between 10 and 30%. The results reported in the following tables are syntheses of 25 analyses run on these imputed datasets. For the parameter estimates and standard errors in the subsequent tables, we used Little and Rubin's (2002) combination rules (see also Snijders & Bosker, 2012).

The imputation uncertainty was small. The between-dataset variance (differences in the estimated coefficients of the predictor variables between the imputed datasets) was much smaller than the within-dataset variance (standard error of the coefficients) was for all the predictor variables. In terms of gender, the missing fractions, which are an indication of the amount of missing information (Snijders & Bosker, 2012), varied between 0.01 (Reading self-concept) and 0.04 (General School and Mathematics self-concepts). For special educational support, the missing fractions varied between 0.08 (General School and Reading) and 0.09 (Mathematics). Finally, the missing fractions of grades varied between 0.06 (General School) and 0.13 (Reading). This implies that at most 13% of the information in a variable was lost because of missing values in the original dataset and that we can be certain that the imputation of missing values had only a miniscule effect on the results.

Growth curve modelling. We analysed the development or changes in students' self-concepts with multilevel growth curve models. We estimated separate multilevel growth curve models for each of the three subscales of academic self-concept. In these growth curve models, the measurement points at Level 1 were nested in students at Level 2. The growth curve models were estimated using the MLwiN 2.28 software program (Rasbash, Steele, Browne, & Goldstein, 2009). For the model estimation, we used the default setting for multilevel modelling in MLwiN, which is iterative generalised least squares (IGLS).

In the first model, only time was included. Here, we modelled the students' self-concept scores as a function of time, resulting in an estimation of the average development of academic self-

concepts of students in Grades 5, 6 and 7 over time. Time was measured at Level 1 and indicates the time difference in years starting at the first measurement point. Given that, in the current study, only three measurement occasions were available and the sample on the student level was relatively small, only linear trends of time were estimated². In the model, the students were allowed to differ in the status of their self-concept at the first measurement point (Grade 5; student-level random intercepts), and they were allowed to differ in the development of self-concept in terms of the strength of the growth or decline (student-level random slopes). At Level 1, the intercept variance indicates differences between measurements within students that are not explained by the general and student-specific trends; this also includes measurement error. The full mathematical properties of the model are provided in Appendix A.

In the second model, we added the student-level predictors of grades, gender and special educational support. For the continuous predictor variable of grades, grand mean centring was applied over all the measurement occasions, while dummy coding was used for the categorical variables of gender and special educational support. The result of this coding is that the intercept of the model maintains a relevant interpretation, that is, the average Grade 5 self-concept for male students in regular education with average grades. We included gender as student-level fixed effects and grade and special educational support as predictors at the measurement level, as the latter component could change over the 3-year study period. Furthermore, we included the cross-level interaction between these student-level predictors and time. Through the fixed effects, we

² To strengthen our conclusions, we also employed growth curve models with a quadratic term included, representing the maximum level of polynomial order given the three timepoints available. The results of the quadratic terms were nonsignificant for all three dependent variables (General School $b = -0.017$, $SEb = 0.044$, $t = 0.386$, $p = .350$; Reading $b = 0.021$, $SEb = 0.044$, $t = 0.477$, $p = .316$; Mathematics $b = 0.063$, $SEb = 0.055$, $t = 1.145$, $p = 0.126$), nor were any of the cross-level interactions between the quadratic time variable and gender, special educational needs (SEN) status and grades. For example, for Mathematics, we found the following results for the cross-level interactions between the quadratic time variable and other predictor variables: t^2 *gender $b = -0.083$, $SEb = 0.069$, $t = 1.203$, $p = 0.114$; t^2 *SEN status $b = 0.119$, $SEb = 0.115$, $t = 1.035$, $p = 0.150$; and t^2 *mathematics grades $b = 0.040$, $SEb = 0.036$, $t = 1.111$, $p = 0.133$. In addition to looking at the potential significance of the quadratic terms and associated cross-level interactions, we considered at potential changes in the coefficients and significance of the predictor variables of the linear term, main effects of gender SEN status, grades and cross-level interactions regarding the linear term. The significant findings remained significant after the inclusion of the quadratic term and associated interaction effects. Furthermore, none of the nonsignificant results became significant.

investigated the differences in self-concepts between boys and girls and students with and without special educational support. Using the cross-level interactions, we investigated the differences between these groups of students in their development of self-concept. The variance components in the second model are the same as in Model 1. The students were allowed to differ in the status of their self-concept at the first measurement point from the predicted status based on the intercept and predictors (Grade 5; student-level random intercepts). The students were also permitted to differ in the development of self-concept in terms of the strength of growth or decline from the predicted development based on the cross-level interactions (student-level random slopes). At Level 1, the intercept variance indicates differences between measurements within students not explained by the general and student-specific trends; this includes measurement error.

3.1 Results

3.1.1 Association between Self-concept Scores in Grades 5 to 7

The correlations among the academic self-concept subscales are presented in Table 2. The students' self-concept scores correlated the highest among several measurements of the same subscale, varying between $r = .419$ (General School self-concept in Grades 5 and 7) and $r = .716$ (Mathematics self-concept in Grades 5 and 6). For all the subscales, the association in self-concept in successive years was stronger than the association between self-concept scores 2 years apart.

(Table 2 about here)

3.1.2 Development of the Three Subscales of Academic Self-concept over Time

The results of the first growth curve models are presented in Table 3. In these models, we estimated linear trends to measure the development in self-concept from Grade 5 until Grade 7. For all the academic self-concept subscales, we found a negative linear trend, indicating that, in general, students' self-concept seems to decline from Grade 5 to Grade 7. The largest decline in the period between Grades 5 and 7 was found for the Reading subscale, $b = -0.171$ points per year, $t = 9.500$, $df = 1619$, $p < .001$, followed by Mathematics, $b = -0.116$, $t = 4.833$, $df = 1619$, $p < .001$; the

smallest decline during this period was found for the General School subscale, $b = -0.056$, $t = 3.111$, $df = 1619$, $p < .001$).

(Table 3 about here)

For each academic self-concept subscale, we found statistically significant amounts of between-student variance concerning self-concept in Grade 5. The biggest differences between Grade 5 students' self-concepts were found for Mathematics and Reading. Similarly, statistically significant between-student differences in random slopes were found for all the academic self-concept scales, which implies that, for each self-concept subscale, the development rates differed among the students. The largest differences in the self-concept development rates between the students were found for Mathematics. For all the academic self-concept subscales, we found negative covariances between the intercept variance and slope variance, indicating that students with an initial high self-concept in Grade 5 showed the greatest decline during Grades 6 and 7.

3.1.3 Differences in Self-concept Development for Gender and Special Educational Support

General School. The results for the inclusion of grades, gender and special educational support in the growth curve models are presented in Table 4. Due to the predictor variables, the model fit improved significantly, indicating that Model 2 is the preferred model over Model 1, $\chi^2 = 160.81$, $df = 6$, $p < .001$. Adding the predictor variables to the model explained 9.4% of the variance regarding initial differences in the General School self-concept and 35.6% of the variance in slopes.

For the General School self-concept, the students in the reference group (boys with average grades and no additional support) started with an average of 3.493 points at the measurement point during Grade 5. A positive association was found between the students' average grades and the General School self-concept, $b = 0.202$, $t = 5.459$, $df = 1619$, $p < .001$, which implies that students with higher average grades had a higher General School self-concept. Furthermore, all other predictors being equal, a statistically significant difference in the General

School self-concept was found between boys and girls, $b = -0.169$, $t = 2.864$, $df = 667$, $p < .005$, indicating a higher General School self-concept for boys than for girls in Grade 5. Similarly, a statistically significant difference in the General School self-concept was found between the no support and additional support students, $b = -0.216$, $t = 2.541$, $df = 1619$, $p < .01$. Students who received additional educational support had statistically significantly lower General School self-concepts than their classmates who did not receive additional support did.

(Table 4 about here)

After we included these predictors in the model, the development of the General School self-concept over time was no longer statistically significantly different from zero. However, a statistically significant relationship between students' grades and development of self-concepts appeared, $b = 0.062$, $t = 2.583$, $df = 1619$, $p < .01$, implying that students with higher average grades had a more positive development of self-concept over time. The General School self-concept developments of boys and girls with average grades and no additional support were extremely comparable, $b = 0.013$, $t = 0.361$, $df = 1619$, $p = .359$. Furthermore, the development of students who received additional support had a slightly positive trend, while the line for students who did not receive additional support had a slightly negative trend. However, the difference in development was not statistically significant, $b = 0.090$, $t = 1.364$, $df = 1619$, $p = .086$.

Reading. Due to the inclusion of the predictor variables of grades, gender and special educational support and the cross-level interaction, the model fit for the Reading self-concept improved significantly, indicating that Model 2 is the preferred model over Model 1, $\chi^2 = 162.10$, $df = 6$, $p < .001$. Adding the predictor variables to the model for self-concept in Reading explained 13.3% of the variance regarding initial differences and 24.5% of the variance in slopes.

Concerning the Reading self-concept, an average score of 3.649 was found at the measurement point in Grade 5 for the reference group (boys with average performance and no additional support). Again, a statistically significant positive relationship was found between

students' reading grades and corresponding Reading self-concept, $b = 0.113$, $t = 3.323$, $df = 1619$, $p < .001$, indicating that students with higher reading grades had higher Reading self-concepts in Grade 5. Furthermore, all other characteristics being equal, girls had a higher Reading self-concept than boys did, $b = 0.319$, $t = 2.231$, $df = 667$, $p < .02$, and students with special educational support had a lower Reading self-concept than students who did not receive additional support did, $b = -0.388$, $t = 4.512$, $df = 1619$, $p < .001$.

A negative trend in the Reading self-concept was found for the reference group, $b = -0.137$, $t = 4.893$, $df = 1619$, $p < .001$ (dotted line). Moreover, students with higher reading grades had a more positive development of the Reading self-concept over time, $b = 0.063$, $t = 2.863$, $df = 1619$, $p < .005$). The model-based predicted development rates of the students' Reading self-concepts for gender and special educational support are presented in Figure 1. The development of boys (dotted line) and girls (solid line) was extremely similar, $b = 0.013$, $t = 0.361$, $df = 1619$ (*ns*), but students who received additional educational support had a more positive development rate for the Reading self-concept, $b = 0.160$, $t = 2.500$, $df = 1619$, $p < .01$, than did their classmates who did not receive additional support. It is clear from Figure 1 that the difference between the Reading self-concepts of students with and without additional educational support was smaller in Grade 7 than it was in Grade 5.

(Figure 1 about here)

Mathematics. Due to the inclusion of the predictor variables of grades, gender and special educational support and the cross-level interaction, the model fit for mathematics self-concept improved significantly, indicating that Model 2 is still preferred over Model 1, $\chi^2 = 289.00$, $df = 6$, $p < .001$. Adding the predictor variables to the model for self-concept in Mathematics explained 25.4% of the variance regarding initial differences and 35.7% of the variance in slopes. The explained variance regarding the initial differences for the Mathematics self-concept was considerably larger than for the model of General School and Reading self-concepts, indicating that

grades, gender and additional educational support are stronger predictors of Mathematics self-concept compared with the two other considered types.

For the Mathematics self-concept, on average, a score of 3.596 was found for the reference group at the first measurement point (Grade 5). Again, students with higher Mathematics grades had more positive Mathematics self-concepts in Grade 5, $b = 0.380$, $t = 10.271$, $df = 1619$, $p < .001$. Although this relationship was found for all three academic self-concept subscales, the coefficient for the Mathematics self-concept was by far the largest. Furthermore, the girls' Mathematics self-concept was statistically significantly lower than that of boys, $b = 0.419$, $t = 5.442$, $df = 1619$, $p < .001$. No statistically significant differences in the Mathematics self-concept in Grade 5 were found between students with or without additional educational support, all other student characteristics being equal.

When the development of the Mathematics self-concept over Grade 5 to Grade 7 was considered, a statistically significant negative trend for the reference group (boys with average performance and no additional support) appeared, $b = -0.093$, $t = 2.513$, $df = 1619$, $p < .01$. All cross-level interactions appeared to be statistically nonsignificant, implying that we did not find large differences in the development rates for the Mathematics self-concept among several groups of students.

4.1 Discussion

In this study, we examined how three dimensions of self-concept (General School, Reading, Mathematics) developed from Grades 5 to 7 in Finland. For all three subscales, a negative linear development was found, indicating that, in general, the students' self-concepts declined from Grades 5 to 7 (approximately 11–13 years of age), which is consistent with earlier research findings (e.g. Cole et al., 2001; De Fraine et al., 2007; Marsh, 1989; Marsh & Ayotte, 2003; Marsh et al., 2006; Wei & Marder, 2014) and supports our hypothesis 1. The decline was largest in the Reading (-0.17 points per year) and Mathematics (-0.12) self-concepts. Furthermore, there were

considerable differences between the students' self-concepts in Grade 5 and the development of the self-concept from Grade 5 to Grade 7. These latter differences were the largest in the development of the Mathematics self-concept. For all three self-concepts, we found that students with an initially higher self-concept showed the greatest decline over the 3 years. De Fraine et al. (2007) had similar findings in their longitudinal study on the development of academic self-concepts. These initial findings made it possible to investigate whether school grades, gender or part-time special education support had a unique effect on the level or trend of the three self-concept domains.

Similar to several earlier studies (e.g. De Fraine et al., 2007; Fredricks & Eccles, 2002; Marsh, 1990a; Wigfield et al., 1991; Wouters et al., 2013), in the present study, there was a clear gender difference across the three self-concept domains. This difference was especially large in the Mathematics and Reading self-concepts, in favour of boys for Mathematics and girls for Reading, supporting hypothesis 2. As expected, school grades had a statistically significant positive relationship with all self-concept domains (e.g. Chen, Yeh, Hwang, & Lin, 2013; Marsh et al., 1999; Marsh & Köller, 2004). In line with earlier studies comparing the self-concept of SEN students or students with learning disabilities to other students (e.g. Allodi, 2000; Bear et al., 1991; Bear et al., 2002; Chapman, 1988b; Pijl & Frostad, 2010; Zeleke, 2004) our study showed that students who received part-time special education support had lower General School and Reading self-concepts than classmates who did not receive additional educational support did. The difference between these groups was not statistically significant for Mathematics when the effects of other predictor variables were controlled for, thereby giving only partial support for hypothesis 3. This suggests that the initial difference in the Mathematics self-concept between students receiving support and others is explained by varying school grades and gender stereotypes rather than the status of receiving support.

The interaction effects of the predictor variables and time in the growth models indicate whether grades, gender and additional part-time special educational support are associated with the

way the self-concept develops across time. Our results are in line with earlier research (e.g. Marsh, 1991; Wigfield et al., 1991) in that gender did not influence the development of the three self-concept domains, thereby supporting our hypothesis 4. In addition, school grades had a positive effect on the development of the General School self-concept and Reading self-concept (see also Marsh & Craven, 2006; O'Mara, Marsh, Craven, & Debus, 2006). The most interesting finding and novel contribution of this study was that receiving part-time special education had a statistically significant positive effect on the development of the Reading self-concept (Figure 1). For boys who received part-time special education support, their self-concept seemed to develop slightly positively, while for boys without part-time support, the development was negative. For the girls who received this support, the decline in their self-concept decreased at a slower rate than it did for girls who did not receive support. A possible explanation for these results for the Reading concept is that part-time special education in Finnish schools emphasises targeting students that need support in reading. Of all students who participate in part-time special education in Grades 1–6, more than half (52%) receive this support due to writing and/or reading problems, while only 21% receive it due to mathematical difficulties and 27% for other reasons (Official Statistics of Finland, 2010). At the same time, it is possible that many students who would benefit from pedagogical support in mathematics do not receive it. As suggested by Finnish studies showing, for example, that only 30–50% of students performing low in mathematics receive part-time special educational support services, the relatively light part-time special education support may not be effective enough to support mathematics learning (Räsänen & Närhi, 2013; Räsänen, Närhi, & Aunio, 2010).

In summary, part-time special educational support seems to counteract the age-normative decrease in the Reading self-concept between Grades 5 and 7. This positive effect of part-time special education is a remarkable finding, because usually, the transition to junior high or secondary school is a special challenge for students struggling with learning, and it often leads to a reduction in academic self-concepts (Arens, Seeshing, Craven, Watermann, & Hasselhorn, 2013; Cole et al.,

2001; Stanovich, Jordan, & Perot, 1998; Wigfield et al., 1991). These results suggest that part-time special educational support for students who spend most of their time in mainstream classrooms does not label them negatively such that their self-concepts decrease. Thus, our study suggests that part-time special education may serve as a protective factor against the negative effects of labelling.

In this study, we do not have precise data on how these possible protective mechanisms function. However, referring to social comparison theory, one explanation could be that the support offered by part-time special education increases students' abilities and experience of competence, which positively influences the development of self-image through internal temporal comparison (Möller & Marsh, 2013). In addition, participation in part-time special education in a small group 1–2 times a week while remaining with a mainstream class the rest of the time provides students with more opportunities for external comparison (Dijkstra et al., 2008). This could mean that these pupils can be like 'fish in two ponds at once'. That is, comparing themselves upward to slightly better students in their mainstream class may result in an improvement in their performances and self-concept (Collins, 1996; Renic & Harter, 1989). At the same time, comparing themselves downward toward the other students receiving part-time special education can enhance or protect their self-concepts (Dijkstra et al., 2008; Renic & Harter, 1989).

4.2 Limitations

This study had several limitations. First, an obvious limitation is that some information was missing in the data. We decided to solve this problem by using multiple imputation techniques that have been found promising. As described, the results were stable, and we trust that we were able to avoid the many problems of bias associated with list-wise deletion of missing data. Second, although our findings on the positive effects of part-time special education on the Reading self-concept are promising, we were unable to determine the exact reason for this support, the level of difficulty the students had or the objectives of the support. However, we know from previous studies (Itkonen & Jahnukainen, 2010; Kivirauma & Ruoho, 2007) that part-time special education

in Finland emphasises literacy issues in support in elementary schools, which is likely reflected in our findings of the initial difference in the self-concept between students receiving partial special education and others and the positive effect of the support status on the Reading self-concept. Third, although we used the analysis term of effect, this is not to imply that we would have been able to establish a causal effect of the predictors in our model. It merely indicated the unique contribution of the predictor when all other variables were held equal. The fourth limitation is that the self-concept measurements cannot be linked exactly with the time of participation in part-time special education. Instead, we used participation in special education as a broader indicator that these students have problems with learning. Finally, although the longitudinal research setting is one of the strong points in this study, a 3-year period still shows only a small fraction of the overall self-concept development. A longer follow-up period could have revealed, for instance, whether the earlier change toward a more positive self-concept after 8th grade (see Cole et al., 2001; Jacobs et al., 2002; Marsh, 1989) would have been evident in Finland. If we had had more than three measurement points available, we could have more effectively fitted trends other than linear ones in the development of self-concept.

4.3 Conclusions and Implications

Researchers have shown that students with special needs have lower academic self-concept than their peers do, but as Bear et al., (2002) noted, it is also important to consider the mechanisms by which all students' self-concept develops in the positive or negative direction. In this study, we found promising evidence that intensified pedagogical support may be helpful for pupils with learning problems, especially in the Reading self-concept. Furthermore, part-time special needs education did not have a negative effect on the development of Mathematics or General School self-concept.

According to O'Mara et al. (2006), the best self-concept interventions combine direct self-concept enhancement with performance enhancement and the use of praise and appropriate

feedback. In future research on self-concept enhancement, it would be worthwhile to establish a more detailed clarification of how part-time special needs education or other types of learning support could enhance students' academic self-concept. Perhaps offering students multiple learning environments in different groupings of students would give more opportunities to make positive social comparisons. This idea would support the principle of developing more inclusive educational arrangements and flexible grouping. One fruitful opportunity for further research may be to distinguish between the affect and competence components of Mathematics and Reading self-concept domains, which is possible to do with the SDQ-I measure (see Marsh, Craven, & Debus, 1998; Marsh & Ayotte, 2003). This more detailed knowledge about how part-time special education enhances pupils' affect or competence in reading or in mathematics would be useful in developing better services for pupils who need support in learning.

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Table 1

Descriptive Statistics on the Variables Used in the Analysis

Grade	Variable	Mean	Standard deviation	Percentage	<i>n</i>
	Gender (girls)			54.4	637
5	Reading self-concept	3.80	0.83		527
	Mathematics self-concept	3.42	1.04		527
	General School self-concept	3.39	0.73		527
	Reading grade	8.49	0.89		470
	Mathematics grade	8.27	0.98		471
	Average grade	8.30	0.80		471
	Special educational support			13.0	529
6	Reading self-concept	3.65	0.86		570
	Mathematics self-concept	3.28	1.03		570
	General School self-concept	3.37	0.77		570
	Reading grade	8.424	0.90		549
	Mathematics grade	8.18	1.06		548
	Average grade	8.25	0.87		549
	Special educational support			14.0	536
7	Reading self-concept	3.47	0.88		528
	Mathematics self-concept	3.20	1.04		528
	General School self-concept	3.30	0.79		528
	Finnish grade	8.03	1.09		554
	Mathematics grade	8.02	1.23		553
	Average grade	8.07	1.03		554
	Special educational support			11.3	533

Table 2

Correlations among Subscales of Academic Self-concept in Grades 5, 6, and 7

Self-concepts		General school			Reading			Mathematics		
		5	6	7	5	6	7	5	6	7
General School	5									
	6	.561**								
		454								
	7	.419**	.615**							
		409	461							
Reading	5	.526**	.398**	.301**						
		527	454	409						
	6	.330**	.575**	.367**	.687**					
		454	570	461	454					
	7	.245**	.430**	.591**	.585**	.680**				
		409	461	528	409	461				
Mathematics	5	.661**	.463**	.269**	.258**	.176**	.113*			
		527	454	409	527	454	409			
	6	.463**	.713**	.422**	.236**	.354**	.247**	.716**		
		454	570	461	454	570	461	454		
	7	.314**	.502**	.709**	.138**	.241**	.401**	.481**	.614**	
		409	461	528	409	461	528	409	461	

** $p < .001$; * $p < .05$.

Table 3

Growth Curve Models for Academic Self-Concept Scales

	General school		Reading		Mathematics	
Fixed effects						
Intercept	3.406*	0.030	3.808*	0.034	3.417*	0.043
Time	−0.056*	0.018	−0.171*	0.018	−0.116*	0.024
Random effects						
Between-students variance	0.344	0.034	0.507	0.043	0.868	0.069
Slope variance for time at the student level	0.059	0.014	0.049	0.013	0.143	0.022
Covariance between intercept and slope	−0.034	0.017	−0.031	0.018	−0.156	0.031
Between-measurements variance	0.211	0.014	0.208	0.014	0.287	0.019
Model fit						
−2*log likelihood	3330.38		3496.12		4189.70	
Number of students	669		669		669	
Number of measurements	1625		1625		1625	

Table 4

Growth Curve Models for Academic Self-Concept Scales for Gender and Part-time special education

	General School		Reading		Mathematics	
Fixed effects						
Intercept	3.493*	0.045	3.649*	0.50	3.596*	0.060
Time	−0.037	0.037	−0.137*	0.028	−0.093*	0.037
Gender (girl)	−0.169*	0.059	0.319*	0.143	−0.419*	0.077
Special education support	−0.216*	0.085	−0.388*	0.086	−0.054	0.105
Grades	0.202*	0.037	0.113*	0.034	0.380*	0.037
Gender (girl)*time	0.013	0.036	−0.026	0.037	0.057	0.046
Special education support	0.090	0.066	0.160*	0.064	−0.044	0.080
*time						
Grades*time	0.062*	0.024	0.063*	0.022	0.000	0.023
Random effects						
Between-students variance	0.281	0.031	0.402	0.038	0.550	0.054
Slope variance for time at	0.038	0.013	0.037	0.013	0.092	0.021
the student level						
Covariance between	-0.034	0.016	-0.040	0.017	-0.108	0.027
intercept and slope						
Between-measurements	0.222	0.015	0.218	0.014	0.312	0.021
variance						
Model fit						
−2*log likelihood	3169.57		3333.93		3900.70	
Number of students	669		669		669	
Number of measurements	1625		1625		1625	

Appendix A.

Full mathematical specification of model 1 (Table 3):

$$y_{ij} = \beta_{0j} + \beta_{1j}Time_{ij} + e_{ij}$$

$$\beta_{0j} = \gamma_0 + u_{0j}$$

$$\beta_{1j} = \beta_1 + u_{1j}$$

$$\begin{pmatrix} u_{0j} \\ u_{1j} \end{pmatrix} \sim \left\{ N \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_{u0j}^2 & \\ \sigma_{u0j,u1j}^2 & \sigma_{u1j}^2 \end{pmatrix} \right\}$$

$$e_{ij} \sim \{N(0), (\sigma_{ei}^2)\}$$

In this model, measurement occasions (indexed by subscript i) at Level 1 are nested within students (subscript j) at Level 2. The regression formula fitted consists of a general intercept (γ_0) and the slope of time (β_1). Time was added as a predictor variable at the measurement level, as indicated by the subscript ij . Given that in the current study only three measurement occasions were available, only linear trends of time were estimated, assuming a single pace in development over the two school years. The time variable in the current study was constructed with the values 0 (Grade 5), 1 (Grade 6), and 2 (Grade 7), by which the Grade 5 self-concept of students became the reference value. Both the intercepts and slopes are allowed to be random at the student level. This implies that students are allowed to have their own intercepts (u_{0j}) and slopes of time (u_{1j}). The random effects are assumed to have each a normal distribution with a mean of 0 and a variance (σ_{u0j}^2 and σ_{u1j}^2) to be estimated. They are also assumed to be statistically independent over the two hierarchical levels. However, within each hierarchical level the random effects are allowed to correlate. This implies that at the student level the covariance between random intercept and

random slope is estimated ($\sigma_{u_{0j},u_{1j}}^2$). This model was estimated separately for each of the three self-concept scales.

Full mathematical specification of model 2 (Table 4)

$$y_{ij} = \beta_{0j} + \beta_{1j}Time_{ij} + \beta_2Grades_{ij} + \beta_3Gender_j + \beta_4SPEC_{ij} + \beta_5Grades * Time_{ij} \\ + \beta_6Gender * Time_{ij} + \beta_7SPEC * Time_{ij} + e_{ij}$$

$$\beta_{0j} = \gamma_0 + u_{0j}$$

$$\beta_{1j} = \beta_1 + u_{1j}$$

$$\begin{pmatrix} u_{0j} \\ u_{1j} \end{pmatrix} \sim \left\{ N \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_{u_{0j}}^2 & \\ \sigma_{u_{0j},u_{1j}}^2 & \sigma_{u_{1j}}^2 \end{pmatrix} \right\}$$

$$e_{ij} \sim \{N(0), (\sigma_{ei}^2)\}$$

Model 2 is an extension of Model 1 by adding a number of predictor variables, that is gender (level 2), grades (level 1), and special educational support (level 1). The coefficients β_2 , β_3 , and β_4 contribute to the explanation of status differences in self-concepts between groups of students, while the coefficients β_2 , β_2 , and β_2 contribute to the explanation of developmental differences in self-concepts between groups. Students are in this model still allowed to have their own intercepts (u_{0j}) and slopes of time (u_{1j}), meaning that students still can deviate from the predicted status and development over time. For the random part, the assumptions regarding the random effects are the same as in Model 1. Again, this model was estimated separately for each of the three self-concept scales.